PSYCHOMETRIKA—VOL. 74, NO. 3, 559–560
SEPTEMBER 2009
DOI: 10.1007/S11336-009-9121-4

BOOK REVIEW

S. FRÜHWIRTH-SCHNATTER (2006) *Finite Mixture and Markov Switching Models*. New York: Springer. 492 + xix pages. US$84.95. ISBN-10: 0-387-32909-9

The book *Finite Mixture and Markov Switching Models* gives complete discussions of mixture models and their extensions. Many models with essentially identical properties often have different names in different disciplines, and this is true in the case of mixture models. For example, latent class models (Lazarsfeld & Henry, 1968) are actually finite mixture models for multivariate discrete data; the latent class regression models (Wedel & DeSarbo, 1994) are finite mixtures of generalized linear models.

The author divided the book into two parts: the first nine chapters focus on the classic aspects of Finite Mixture Models, and the remaining four chapters introduce Markov Switching Models to deal with longitudinal data. The chapters of this book are structured logically such that readers can easily navigate to specific topics of interest.

Chapter 1 introduces finite mixture models, and Chaps. 2 through 4 cover statistical inference of finite mixture models with known or unknown number of mixtures. A collection of computational tools for Bayesian inference are discussed in Chap. 5. Chapter 6 is devoted to the mixtures of normal distributions that consist of the most important cases of mixture models. Chapter 7 discuss some practical applications of mixtures of normal distributions. Finite mixtures of regression models and several useful extensions are covered in Chap. 8. Chapter 9 presents a thorough discussion of finite mixture modeling of non-Gaussian data. Building on the foundation of the earlier chapters, Markov switching models and related models that model the dependence over time are introduced in Chaps. 10 through 13.

One unique characteristic of this book is that the author includes both Bayesian and frequentist perspectives on statistical inference. Although the author's viewpoint leans toward Bayesian, I admire her decision to cover both perspectives. The author gave good reviews of several frequentist techniques in estimation, but much more attention is paid to Bayesian methodology. The author's wide and extensive knowledge in Bayesian methods and techniques is clearly demonstrated throughout this book. Because of the comprehensive coverage of Bayesian methods and many newly developed computational techniques, this book could serve as a good reference for Bayesian analysis. Coming from a training of the frequentist approach, I was not immediately "converted" into a Bayesian after reading this book; however, I did gain a greater appreciation of the Bayesian approach and become more open to employ Bayesian methods in my future research.

The issue of identifiability in mixture models is a very important but often overlooked topic. The author is to be commended for putting extensive effort into addressing this issue. The author discusses different scenarios of nonidentifiability as well as clearly describes the causes and impacts of an unidentified model. In addition, the author provides and suggests several possible approaches of achieving model identification.

The author should be acknowledged for trying to clarify the connections between models across different disciplines. Same models named differently in different disciplines could be a source of confusion; for example, the *latent class regression models* in marketing (Wedel & DeSarbo, 1994) are also known as *switching regression models* in economics (Quandt, 1972), as *mixture-of-expert models* in the machine-learning literature (Jacobs, Jordan, Nowlan, & Hinton,

1991), and as *finite mixtures of regression models* in this book. The author has done a great job in pointing out and clarifying the connections of similar models in different disciplines.

A nice feature of this book is that a MATLAB package can be obtained from the author. This MATLAB package, `bayesf` (Version 2.0), includes implementations of algorithms and methods discussed in the book as well as 140 pages of documentation explaining how to use the package. Although the author tried to strike a balance between the Bayesian and frequentist viewpoints, the implementations in MATLAB code are mainly Bayesian. In general, I found the MATLAB package not very intuitive to use, and I would appreciate more examples and clearer instruction. Nevertheless, the availability of this MATLAB package helps readers and potential users gain a deeper understanding of the material in the book through "hands-on" experience.

At first glance, the numerous equations and formulas may seem to be daunting for psychologists with limited statistical background; however, the descriptions and explanations of the various models are actually quite reader friendly (more so than many advanced statistical textbooks). The author has done an excellent job of inviting newcomers to enter the world of mixture models, more impressively, the author did so without sacrificing mathematical and statistical rigor. Mixture models are appealing in many applications in social and psychological studies. This book not only offers a gentle introduction to mixture models but also provides more in depth coverage for those who look beyond the surface. I believe that psychologists who are interested in related models (e.g., latent class models, latent Markov models, and latent class regression models) will benefit greatly from this book. I highly recommend this book to all psychologists who are interested in mixture models.

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Published Online Date: 22 APR 2009